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CROSS-TIES PURCHASED BY THE STEAM RAILROADS OF THE UNITED STATES IN 1905.

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The following report upon the cross-ties purchased by the railroads in 1905 is based upon statements from 770 steam railroad companies. Of those which failed to report, only one operates more than 1,000 miles of track, and that one less than 1,300. The average mileage of the remainder is approximately 45. The total mileage unreported is 8,671. Since the total trackage in the United States on January 1, 1905, was, according to Poor's Manual, 293,937 miles, the unreported trackage amounts to but 2.9 per cent of the total.

In presenting this report the Forest Service desires to acknowledge the hearty cooperation of the officials of the various companies throughout the United States in furnishing the necessary data.

These statistics do not necessarily represent the number of cross-ties used in 1905, since they are compiled from the statements of ties purchased. However, there is but little doubt that the law of averages applies sufficiently well in this instance to warrant the assumption that the total represents, with a very fair degree of accuracy, the actual number of ties laid.

PRODUCTION.

The total number of ties reported is 77,981,227, switch ties being reduced to an equivalent number of cross-ties. Of the total number of ties purchased, 14,459,521, or approximately 18.5 per cent, were for use in the construction of new track, leaving 63,521,706 for renewals. It will be noted that this is less than the total announced in the preliminary statement made by the Forest Service under date of May 17, 1906. This is the result of a correction for duplication made in compiling the preliminary report. Assuming that the unreported 2.9 per cent of trackage required ties in the same proportion as the reported trackage, the total number of ties purchased by the steam railroads of the United States in 1905 was 81,562,150. Estimating 10,000,000 additional ties for the electric lines, the total number of ties purchased last year in the United States was, in round numbers, 91,500,000.

Table 1 shows the average cost and the total value of the various kinds of ties. The values given are based upon reports of representative roads in each region and are for ties delivered on the right of way.

TABLE 1.—*Value of ties purchased by steam railroads of the United States in 1905.*

Kind of wood.	Number.	Average cost per tie.	Total.
Oak	34,677,304	$0.55	$19,072,517.20
Pine	18,351,037	.42	7,707,435.54
Cedar	6,962,827	.44	3,063,643.88
Chestnut	4,717,604	.48	2,264,449.92
Red fir	3,633,276	.33	1,198,981.08
Cypress	3,483,746	.33	1,149,636.18
Tamarack	3,060,082	.36	1,101,629.52
Hemlock	1,713,090	.33	565,319.70
Redwood	590,852	.20	118,170.40
Western larch	311,120	.45	140,004.00
Spruce	148,168	.35	51,858.80
Birch	35,500	.40	14,200.00
Beech	34,227	.40	13,690.80
Maple	25,500	.40	10,200.00
Miscellaneous	236,894	.48	113,709.12
Total	77,981,227	----------	36,585,446.14

Table 2 gives, by species, the number and per cent of hewed and sawed ties purchased during 1905.

TABLE 2.—*Ties purchased by steam railroads of the United States in 1905.*

Kind of wood.	Hewed.			Sawed.			Total.	
	Number.	Per cent of all ties of kind.	Per cent of all hewed ties.	Number.	Per cent of all ties of kind.	Per cent of all sawed ties.	Number.	Per cent.
Oak	30,296,498	87.4	50.2	4,380,806	12.6	24.9	34,677,304	44.5
Pine	11,799,435	64.3	19.5	6,551,602	35.7	37.2	18,351,037	23.5
Cedar	4,842,651	69.6	8.0	2,120,176	30.4	12.6	6,962,827	8.9
Chestnut	3,252,046	68.9	5.4	1,465,558	31.1	8.3	4,717,604	6.1
Red fir	1,410,215	39.0	2.3	2,223,061	61.0	12.6	3,633,276	4.6
Cypress	3,095,760	88.9	5.1	387,986	11.1	2.2	3,483,746	4.5
Tamarack	3,049,972	99.7	5.1	10,110	.3	(a)	3,060,082	4.0
Hemlock	1,599,283	93.4	2.6	113,807	6.6	.6	1,713,090	2.2
Redwood	500,904	84.8	.8	89,948	15.2	.5	590,852	.8
Western larch	247,425	77.9	.4	63,695	22.1	.3	311,120	.4
Spruce	60,190	40.6	.1	87,978	59.4	.5	148,168	.2
Birch	25,500	71.8	.1	10,000	28.2	(a)	35,500	(a)
Beech	6,020	17.9	(a)	28,207	82.1	.1	34,227	(a)
Maple	25,000	98.0	.1	500	2.0	(a)	25,500	(a)
Miscellaneous	187,942	79.3	.3	48,952	21.7	.2	236,894	.3
Total	60,398,841	[b]77.4	100.0	17,582,386	[b]22.6	100.0	77,981,227	100.0

[a] Less than one-tenth of 1 per cent.

[b] Per cent of all ties.

The table shows that oak, the greater part of which is doubtless some variety of white oak, furnishes 44.5 per cent, or almost one-half, of the total number of ties. Assuming that the average tie contains 30 feet, board measure, the amount of timber represented by the white-oak ties is over one billion board feet, or approximately one-fourth of the total amount of oak lumber produced in one year, according to the Twelfth Census. Nearly all of the oak is converted into hewed ties, only 12.6 per cent being sawed.

Pine ranks next in importance, with 23.5 per cent, and while it can not be definitely stated just what proportion should be assigned to the various species, it is certain that more than three-fourths of the pine ties are southern yellow pine. The white and Norway pines should be credited with from 3 to 4 per cent and the western yellow pine of the Rocky Mountain and Pacific Coast regions with from 17 to 18 per cent. These estimates are deductions from Table 3, which shows the number of pine ties which come from each region. Cedar ranks third with 8.9 per cent, followed closely by chestnut with 6.1 per cent. Both of these species are excellent tie woods and would figure more largely in the total production were it not for the limited distribution and supply of each. The percentage of the total number of hewed and sawed ties is, hewed, 77.4; sawed, 22.6.

Statistics are lacking for a comparison of the present output of ties with the number from each kind of timber in other years, but it is very probable that were they available it would be shown that the number and proportion of the pine ties have increased very materially within the last decade. Correspondingly, the proportion of oak ties would doubtless show a decrease for the same period.

The four leading kinds of timber for ties are oak, pine, cedar, and chestnut, which combined furnish 83 per cent of the total number, oak and pine alone furnishing 68 per cent. Next in rank is the red fir of the Pacific Coast and Rocky Mountain region with 4.6 per cent, followed by the cypress of the South with 4.5 per cent. The tamarack, or eastern larch of the New England and Lake States, and the eastern hemlock are the only other species credited with more than 1 per cent of the total number. Beech, birch, and maple were reported in amounts of less than one-tenth of 1 per cent each. The miscellaneous classification includes a number of woods, among which the most important are red gum, black locust, elm, hickory, and red cedar. Thus some twenty kinds of timber enter into the production of railroad ties, but of these only seven, at most, are important.

SUPPLY.

Until a comparatively short time ago the railroads were usually able to secure an ample supply of ties from lands adjacent to their rights of way. This has been especially true of the vast network of lines which traverse the territory east of the Mississippi River. While this source is by no means exhausted, it has become seriously depleted, and where in former years the purchasing agent could contract for an almost unlimited number of white-oak ties with the assurance that they would be promptly furnished, at the present time it is necessary to contract for small quantities and to anticipate the demand far in advance.

Wherever the whole tree is worked up into ties, sawing permits of by far the closer utilization of material. From this it might be inferred that the present practice of hewing the majority of the ties is poor policy, judged from the standpoint of economy. As a matter of fact, however, little of the material which is converted into hewed ties is saw timber, consisting, as it does, of tops left from lumbering both conifers and hardwoods, or small trees from which, even though sawed, little, if any, additional tie stock could be secured, and heart timber full of knots, shake, and similar defects.

Where the tie was once the major product, it is now generally a minor product. The Pacific Coast is practically the only region in the United States where ties are produced as a major product of the forest. One of the most important sources of the ties in the East is the farmer's woodlot. During the winter in this region large numbers of ties are hewed and hauled to the railroads.

In determining the geographical distribution of the regions of supply, it was found impractical to attempt a classification by States on account of the manner in which the railroad companies furnished the information on this item. It was found possible, however, to determine the source, with a degree of certainty, by grouping the States as follows:

Region.	*States included.*
Southern	Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Texas, Indian Territory.
Central	Ohio, West Virginia, Kentucky, Tennessee, Indiana, Illinois, Missouri.
Lake	Michigan, Wisconsin, Minnesota.
North Atlantic	New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland.
Pacific Coast	Washington, Oregon, California.
Rocky Mountain	Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico.

Table 3 shows, for the various regions, the number of hewed and sawed ties obtained from each kind of timber, arranged in order of importance. The regions are arranged from left to right according to the number of ties purchased.

TABLE 3.—*Source of supply of ties purchased by steam railroads of the United States in 1905.*

Kind of wood.	Regions.					
	Southern.		Central.		Lake.	
	Hewed.	Sawed.	Hewed.	Sawed.	Hewed.	Sawed.
Oak	11,406,130	570,806	14,554,592	2,966,758	240,824	101,823
Pine	10,197,766	4,182,193	10,400	18,600	641,941	2,420
Cedar	----------	700	----------	----------	4,400,305	1,744,937
Chestnut	114,192	9,145	155,632	22,608	----------	----------
Red fir	----------	----------	----------	----------	----------	----------
Cypress	3,087,960	386,986	7,800	1,000	----------	----------
Tamarack	----------	----------	----------	----------	3,026,193	6,491
Hemlock	----------	----------	----------	----------	1,556,421	44,278
Redwood	----------	----------	----------	----------	----------	----------
Western larch	----------	----------	----------	----------	----------	----------
Spruce	----------	----------	----------	----------	----------	----------
Birch	25,000	----------	500	----------	----------	----------
Beech	2,500	----------	2,000	1,500	----------	2,000
Maple	25,000	----------	----------	500	----------	----------
Miscellaneous	15,237	3,460	15,781	11,199	40,935	5,519
Total	24,873,785	5,153,290	14,746,705	3,022,165	9,906,619	1,907,468
Per cent of all ties purchased in region	82.8	17.2	83.1	16.9	83.9	16.1
Total of hewed and sawed	30,027,075		17,768,870		11,814,087	
Per cent	38.5		22.8		15.1	

TABLE 3.—*Source of supply of ties purchased by steam railroads of the United States in 1905*—Continued.

Kind of wood.	Regions.						Total.
	North Atlantic.		Pacific.		Rocky Mountain.		Hewed and sawed.
	Hewed.	Sawed.	Hewed	Sawed.	Hewed.	Sawed.	
Oak	4,094,952	741,419	------	------	------	------	34,677,304
Pine	3,137	2,000	------	1,254,125	946,191	1,092,264	18,351,037
Cedar	412,505	323,176	29,841	25,163	------	26,200	6,962,827
Chestnut	2,982,222	1,433,805	------	------	------	------	4,717,604
Red fir	------	------	216,696	2,190,581	1,193,519	32,840	3,633,276
Cypress	------	------	------	------	------	------	3,483,746
Tamarack	23,779	3,619	------	------	------	------	3,060,082
Hemlock	42,862	69,529	------	------	------	------	1,713,090
Redwood	------	------	500,904	89,948	------	------	590,852
Western larch	------	------	22,730	------	224,695	63,695	311,120
Spruce	------	------	------	------	60,190	87,978	148,168
Birch	------	10,000	------	------	------	------	35,500
Beech	1,520	24,707	------	------	------	------	34,227
Maple	------	------	------	------	------	------	25,500
Miscellaneous	115,989	18,774	------	10,000	------	------	236,894
Total	7,676,966	2,627,029	770,171	3,569,817	2,424,595	1,302,617	------
Per cent of all ties purchased in region	74.5	25.5	17.7	82.3	65.0	35.0	------
Total of hewed and sawed	10,303,995		4,339,988		3,727,212		77,981,227
Per cent	13.2		5.6		4.8		100.0

The Southern States rank first, furnishing over 38 per cent, while the Central States rank next with nearly 23 per cent of the total number of ties. These groups of States, which comprise practically all of the great hardwood forests of the country and all of the cypress and southern pine forests, furnish nearly two-thirds of the number of ties. The Lake States rank next with 15 per cent, followed closely by the North Atlantic with about 13 per cent. Thus it will be seen that practically 90 per cent of the ties are now obtained east of the Rocky Mountains. The Pacific Coast and Rocky Mountain regions, as yet, are not very important factors in the production of ties. This is explained by the fact that these regions at the present time probably do not supply tie material for much trackage beyond their limits, since the long haul to the eastern market makes it impossible for their ties to compete successfully with ties produced in the East.

The method of production in the Pacific Coast region, as compared with other regions, is brought out in a striking manner. It will be seen that the Pacific Coast is the only region in which more sawed than hewed ties are produced, 82.3 per cent being sawed. Practically the opposite condition is found in the Southern, Lake, and Central regions. The Rocky Mountain region follows next in proportion of sawed to hewed ties. Here, however, but 35 per cent are sawed. This condition is explained in part by the fact that timber is more plentiful and the stumpage value lower in the West than elsewhere; consequently the market for the lower grades of lumber is poor, and as there is always a ready market for ties, much of the lower grades is sawed into ties. Other factors also have an influence, the most important of which is the sparse population, which deprives the region of the supply obtained from farmers' woodlots, an important feature in the eastern tie market. While it is not to be expected, as with the production of lumber, that the Pacific Coast will ever become the chief source of supply for railroad ties, nevertheless the proportion will doubtless steadily increase.

PRESERVATION.

As a result of the realization that the supply of tie material was not limitless, and more especially when it was found that the durable white oak could no longer be secured in sufficient quantities to meet the demands for renewals and new track, an attempt was made to devise methods for increasing the length of service of the inferior woods. Tie plates were introduced with marked success in reducing the wear when used on soft woods. It was soon found, however, that the tie plate was not sufficient, since the wood decayed so rapidly that renewals in a short time were often necessary. To meet this problem, experiments in preservative treatments of ties were taken up by several railroad companies, some of them working in cooperation with the Forest Service, and it seems safe to predict that within a comparatively short period of time more treated than untreated ties will be used. The statistics for 1905 show that 7,510,000 ties, or nearly 10 per cent of the total number purchased, were given a preservative treatment of some character.

During 1905 at least ten railroad companies were operating their own plants for the preservation of their construction material, and several others are contemplating the installation of such plants. In addition to the roads which treat their own timber, many others have their timber treated at commercial treating plants.

Approved:
W. M. Hays,
Acting Secretary.

Washington, D. C., *August 22, 1906.*

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